REPRODUCTIVE HEALTH FOCUS

REPORT ON PROJECTS FOR REDUCTION OF MATERIAL ANEMIA

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Vadodara, India: The Impact of Iron Supplements on Adolescent Growth and Anemia Prevalence

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Project Period: 1997 - 1998

I. Background:

Adolescence is second only to infancy as the period of most rapid growth. Adolescents are also particularly vulnerable to both macro and micronutrient deficiencies. Globally, 26% of adolescents in developing countries are anemic, but recent studies conducted by the Department of Food and Nutrition, M.S. University of Baroda found anemia (Hb < 12g/dL) prevalences to be above 70% among adolescent girls in Vadodara. Because maternal anemia is linked with a high risk of maternal and fetal deaths, premature delivery, low birth weight, and perinatal mortality (WHO 1986), programs aimed at improving the health and nutritional status of adolescent girls are necessary so that girls enter their reproductive years without serious iron deficiency. There is also a need to impart nutrition education to adolescent girls in an effort to increase their intake of iron rich foods.

Earlier qualitative studies (Kanani, 1994) show that adolescent girls experience a range of symptoms associated with anemia and some have ideas about interventions to cure the condition (e.g., improved dietary quality and "tonics"). Anorexia (loss of appetite) is one of the symptoms associated with anemia. This is of particular concern for adolescents as it may adversely affect dietary intake and growth.

Over the past decade, India has seen a steady increase in the enrollment rates of girls within the school system (UNICEF 1994). This phenomenon, combined with unacceptably high anemia prevalence rates among this vulnerable group led the researchers to investigate the impact of iron supplementation on poor urban adolescent girls, using the school system as a vehicle for anemia reduction with a weekly IFA intervention. A second study, community-based, with urban poor girls, pursued anemia reduction through a daily IFA intervention.

II. Study Objectives and Strategies:

A. Daily Iron Supplementation

1. Objective

To assess the impact on growth, hemoglobin status, and appetite of daily iron folate supplementation tablets over a 3-month period on urban slum-dwelling adolescent girls.

2. Study Population and Methods

This study was carried out in three slums of Vadodara, where the Baroda Citizens Council (BCC) implements community development programs. Of the 203 study participants, whose ages ranged from 10 to 18 years, 56% of the girls were Hindu. Approximately 50% of the family per capita incomes ranged from $5-10 per month. Anemia prevalence (Hb <12g/dL) was 81% among the study population. Any girls with severe anemia (defined as Hb <8 g/dL in this study) were excluded from the study (although no such girls were identified). More than half (59%) of the girls were undernourished (body mass index < 80% of the standard). Approximately 20% of the girls consumed meat or eggs weekly, while 33% consumed meat or eggs once in a two-week period. Anemic subjects scored significantly lower on a rating scale for measuring appetite than non-anemic subjects in the baseline assessment.

Two of three slums were randomly allocated to either the control group, and the third was the experimental group. Girls received either one tablet containing 60 mg elemental iron and 0.5 mg folic acid or a placebo tablet (dicalcium phosphate) daily for three months. Baseline assessments included biochemical and anthropometric measurements (hemoglobin, weight and height-for-age, BMI), dietary intake by food frequency questionnaires, history of anorexia (checklist and rating scale) and perceptions of health, nutrition, and anemia using a semi-structured questionnaire. Masters and doctoral students from the Department of Foods and Nutrition, M.S.University of Baroda, functioned as data collectors and were involved in the data management, analysis, and report production.

3. Results

A high level of compliance with the iron supplements was achieved with 90% of the participants consuming more than 85 of the 90 tablets. Girls in the experimental group experienced a significant ($p<0.001$) mean change in hemoglobin level (+1.73 g/dL) compared to the girls in the control group (-0.08 g/dL). The increment of change was more pronounced in the anemic subjects. There was a marked shift to the right in the hemoglobin frequency distribution curve of the experimental group after the intervention that was not reflected in the control group. Appetite scores significantly ($p<0.001$) improved among the girls in the iron supplementation group, according to the checklist and self-rating. Iron supplementation appeared to maintain BMI in the experimental group, while there was some deterioration in BMI among the control group; the trend was similar when the results were disaggregated by anemia status. Weight gain was significantly ($p<0.001$) greater (close to 1 kg) among the supplemented girls; the increase was negligible among the control group (.04 kg). Disaggregation by anemia status did not produce the anticipated difference in weight gain.

B. Weekly Iron Supplementation

1. Objective

To assess whether weekly supplementation with iron folate tablets provided through schools for a 6 month period has an impact on increasing appetite, growth, and hemoglobin levels of adolescent girls.

2. Study Population and Methods

The study population was drawn from a school in urban Vadodara serving girls from low to middle income households. The entire school population was sampled, yielding an initial sample size of 2090 girls. Monthly per capita income of 50% of the families was approximately $5-14. Ninety-five percent (95%) of the girls were vegetarian, and 99% were Hindu. According to BMI at baseline, 25% of the participants were undernourished (below 80% of reference standard BMI). Overall, 75% of the girls had anemia (Hb <12g/dL), and 7% had severe anemia (Hb <8.0 g/dL). Girls with severe anemia were treated and excluded from the study. Dietary consumption of iron-rich or iron absorption enhancing foods was low due to a combination of vegetarian diet restrictions (no animal products) and dislike of alternative sources of iron. No difference in mean appetite scores was found between anemic and non-anemic subjects at baseline. This was attributed to the difficulties of administering the assessment tool to a large sample of girls (n=1013); individual assistance and supervision was not possible as in the first study.

The study design was a double blind experimental placebo controlled trial. A total of 1517 girls were stratified by age into 3 groups (10 to 12 years, 13 to 15 years, and 15 to 19 years). They were further divided by hemoglobin levels ($\geq$ 11g/dL, 8.1 to 10.9 g/dL, $\leq$ 8g/dL) and girls in the first two hemoglobin groups were randomly assigned to experimental or control groups. The experimental participants were given weekly iron folate supplements containing 100 mg elemental iron and 0.5 mg folic acid. The control group was given weekly dicalcium phosphate placebo tablets.

Supplementation was supervised in the classroom for 6 months. Classroom teachers and study investigators monitored compliance with supplement consumption and recorded compliance in specially designed registers.

3. Results

Impact analysis was performed for the 729 girls who consumed at least 80% of the total dose of tablets (21 or greater). There was no significant difference in the extent of decrease in percent prevalence of anemia between the experimental and control groups. There was a similar shift to the right in the frequency distribution curve of both groups indicating that improvements in hemoglobin status are more a function of adolescent growth than the impact of weekly iron folate supplements. Similar increases in growth – weight, height, and BMI – were noted in both experimental and control groups, whether grouped overall, or disaggregated by anemia status.

Teaching staff was highly cooperative with the administration of tablets and compliance monitoring. In the few situations where teachers were unhappy about the time costs, students enthusiastically assumed responsibility for tablet distribution and compliance monitoring. The

age of the girls affected compliance; younger girls were more compliant than their older counterparts.

III. Project Outcome:

Daily iron folate supplements for 3 months produced positive impacts on adolescent girls' hematinic status and growth, in contrast to an absence of significant impact among girls supplemented weekly for a period of 6 months. A non-significant trend toward improvement in hemoglobin level was evident among the experimental group in the weekly trial, but among this study population of rapidly growing anemic girls, the weekly supplementation regimen was not adequate to meet iron needs, significantly reduce anemia, or improve growth.

IV. Key Conclusions Regarding Lessons Learned:

Raising the iron status of adolescent girls is important for their own health and well-being as well as for their long-term reproductive health.

Few studies have looked at the impact of iron/folate supplementation on adolescent growth. The results of the first study indicate that among some populations, daily iron supplementation for at least 12 weeks can improve pubertal growth, possibly through improved appetite.

While there have been several studies in different regions of the world that document efficacy of a weekly iron/folate regimen among non-pregnant women and adolescents, the second study in Vadodara did not demonstrate similar results. Apparently the iron needs of this population of rapidly growing, anemic adolescents exceeded the amount of iron available in a weekly dose.

Both studies suggest that with well designed nutrition awareness activities combined with counseling on management of side effects, a majority of adolescent girls will comply with either daily or weekly IFA supplements. Implementing these interventions through the schools appears to be a feasible method for reaching large numbers of girls during their pre-adolescent and adolescent years (at least in settings where many, if not most girls attend secondary school). In the adolescent span of 10 through 19 years of age, the younger girls (10-14 years old) especially the pre-menarcheal phase, should be the focus of attention for improving growth and reducing anemia as they are undergoing rapid pubertal growth and tend to be more undernourished than older girls.

V. Publications:

- Shubhada, Kanani; Poojara, Rashmi. *Supplementation with Iron and Folic Acid Enhances Growth in Adolescent Indian Girls.* Journal of Nutrition. 130: 452S-455S, 2000.
- Shubhada, Kanani; Poojara, Rashmi. *Supplementation with Iron and Folic Acid Enhances Growth in Adolescent Indian Girls. Experimental Biology Symposium: Improving Adolescent Iron Status before Childbearing,* Washington, DC. April 17-21, 1999.

- Shubhada Kanani et al. *The Impact of Iron Supplementation on Appetite and Growth of Adolescent Girls of Vadodara. Vadodara, India*: John Snow, Inc., MotherCare, 1998.

Vadodara, India: Health Systems Research for Anemia Control and Pregnancy

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Project Period: January 1997-August 1998

I. Background:

In the urban slums of Vadodara, India low compliance with iron folic acid (IFA) tablet supplementation by pregnant women is in part due to shortcomings in the delivery system and ineffective promotion strategies. In 1990 only 25% of pregnant and lactating women from the slums had received a full course of iron supplements and 33% had not received supplements at all (Nutrition Research and Training Centre 1990). The IFA tablet delivery system of the anemia control programs in the Vadodara Corporation was found to be unsatisfactory: the system was lacking in structure and had no designated days for tablet distribution, no tracking system in place to record the number of tablets distributed or consumed, and client follow-up and counseling were inadequate.

In Vadodara, the iron supplementation delivery system is managed through the Family Centres and Health Posts of the Vadodara Municipal Corporation (VMC). Each of the nine health posts covers a population of approximately 50,000, and is staffed by one Lady Medical Officer (LMO), one Female Supervisor (FHS), four Female Health Workers (FHWs), one vaccinator, an accountant clerk, and one assistant. The Anemia Control Program (ACP) implemented through the health posts and home visits is similar to India's national program, with 100mg elemental iron + 0.5mg folic acid tablets given daily to pregnant and lactating women for 100 days.

II. Study Objectives:

The major objective was to improve the implementation of antenatal care (ANC) services, with special emphasis on anemia control, in two Health Posts of the Vadodara Municipal Corporation serving lower socioeconomic urban areas with a population of approximately one million. The following is a list of specific objectives:

1. To conduct a situational analysis of the Anemia Control Program for urban, poor pregnant women.

2. To improve the implementation of the antenatal care services, especially anemia control in pregnant women, by the health functionaries (Lady Medical Officer, Female Health Worker).
3. To evaluate the effectiveness of different program strategies for improving antenatal care and anemia control such as training, procurement and distribution of iron tablets, production of IEC materials and its use by FHWs, monitoring, and the supervisory system.
4. To assess the impact of enhanced antenatal care and anemia control on anemia, beliefs and practices regarding anemia and iron supplementation among pregnant women, and on the birthweight of newborns.

III. Study Strategies:

The study to improve the delivery system of IFA tablets was divided into four phases: 1) Phase I - A situational analysis in which formative research was carried out with functionaries of all 9 health posts of the Corporation; 2) Phase II- The development and implementation of selected strategies with participation of VMC's health officials; 3) Phase III - An iterative process alternating process evaluation and program improvement focused on changes occurring in the health system; and 4) Phase IV - Advocacy efforts undertaken with the Government of Gujarat health officials to emphasize the need for giving ACP much needed attention and to improve the quality of its implementation.

III. Results:

Phase I - The Anemia Control Program: Results of the Situational Analysis

1. Health workers

- The FHWs undergo training for 1½ years after secondary schooling. This training includes a course on nutrition in which the FHWs receive information regarding vitamins and minerals including iron.

- According to a nursing tutor, anemia control was a weak component of the training and not much importance was given to it. There were few IEC materials on anemia and the benefits of iron supplementation to be used in training as well as with the general public. The chief medical officer and the FWMO who oversee the Corporation's health program stated that the Government of Gujarat (GOG) pays little attention to urban functionaries' training needs; most of their training programs concentrate on rural programs.

- The supply of IFA tablets in the health centers was sometimes inadequate, erratic, and their distribution by health functionaries' was infrequent. Home visits by FHWs were irregular and no follow up visits were made to monitor compliance. Monitoring was done only with regard to the number of tablets given to pregnant women who visit the MCH clinic.

- The health providers were well aware of the common causes of anemia. All health workers (LMOs, FHSs, and FHWs) said that they counseled women to take IFA tablets and to increase the intake of iron-rich foods. The general problem encountered during counseling, according to them, was that though the women agreed to take iron tablets they

did not put the advice into practice. Health workers noted the main reasons behind non-consumption of iron tablets to be the lack of awareness regarding the benefits of tablet consumption, side effects, unpleasant taste, and refusal of the woman's elder family members allowing the woman to consume the tablets. It was suggested that the family members of the women should be taken into confidence to gain their cooperation.

2. Pregnant Women

- Pregnant women residing in the areas of the health posts were enrolled in the study if they were 20-24 weeks of gestation (n=153). They were classified, based on their hemoglobin levels, into normal (Hb ≥ 11 g/dL), mildly anemic (Hb = 10-11 g/dL), moderately anemic (Hb = 7-9 g/dL), and severely anemic (Hb < 7 g/dL). The anemia prevalence was 88% in the group with 11% of women having severe anemia.

- When asked to free-list foodstuffs they thought would strengthen their blood, the women showed lack of awareness regarding specific foods rich in iron and vitamin C. Food intake data suggest that in view of the availability of iron and vitamin C rich foods, as well as few food taboos during pregnancy, it is likely that a well implemented nutrition and health education program would help encourage women to improve their diets.

- The majority of the women were registered in health facilities and their family members were aware of it. The awareness of services such as weight monitoring, receiving iron tablets, vaccination against tetanus toxoid, and physical checkups was found to be higher (43-65%) compared with services such as receiving nutrition health education (NHE), including dietary advice (2-3%).

- All ANC services were perceived to be useful by the women and their family members; however, half of them could not elaborate on the reason. The awareness of the purpose of NHE was low in the pregnant women and even lower in their family members. This may be due to the fact that NHE is infrequently administered during ANC visits. More than 80% of the family members could not respond regarding NHE.

- Regarding the importance of iron supplementation to increase appetite, awareness was higher in the pregnant women (60%) than their family members (35%). Pregnant women were aware of the benefits of iron supplementation.

- Less than half of the women and family members gave suggestions regarding the improvements of ANC services listed below:

  1. Transportation available to and from the health post to the slum area for antenatal check-up and to take the women to government hospitals at the time of delivery

  2. Home visits by the doctors in the community

  3. NHE to be given during the home visits by the FHWs and the doctors

  4. Other medicines for common illnesses such as fever or cold should be provided at the health posts

5. Meetings should be organized with participation of pregnant and lactating women wherein the lactating women could share their experiences with the pregnant women.

Phase II - Improving the Health System for Better Anemia Control: The Intervention
The situational analysis carried out in Phase I revealed weaknesses in the health system. Table 1 summarizes the drawbacks observed in the system and the interventions planned to address them

Table 1. Weaknesses in the Health System and Interventions Planned

Gaps in the Health System	Interventions Implemented to Address them
Lack of clarity regarding job functions for ANC at all levels	• Formulation and dissemination of specific job functions by the health authorities to health workers or service providers
Unplanned distribution of iron supplements and infrequent home visits by health workers	• Streamlining the distribution system: a combination of clinic and home-based approach. Minimum of 3 visits and 100 tablets to each woman are emphasized.
Virtually absent supervision and no monitoring of compliance with iron supplementation	• Changes in workload of supervisors by health officials to enable better supervision • Simple modification of ANC registers and home visit registers to incorporate data on compliance (distribution and consumption of tablets)
Absence of IEC strategy in the program Lack of counseling during tablet distribution to women	• Production of IEC material on anemia in pregnancy • Training to FHWs and their supervisors in counseling skills • Incorporation of IEC activities in routine job functions
Low priority accorded to the anemia control program in the government health system	• Training to increase awareness and to highlight the importance of anemia control along with other antenatal care services • Intensified monitoring of ANC and iron supplementation by senior health officials • Advocacy efforts through fact sheets, video, information booklets for the state government and urban health officials

Phase III - Response of the Health System to the Interventions for Improving Anemia Control: A Process Evaluation

- Follow-up visits to the health posts found that movement registers, to be filled every time the FHWs went out of the health post for work, were often incomplete and sometimes had

been filled out by another FHW. The registers only mentioned that iron tablets were given to a particular pregnant of lactating women, but did not specify the number of packets/tablets given. Anemia counseling efforts with pregnant women on the part of the FHWs were infrequent.

- Direct observation revealed that most women went to MCH clinics for immunization of their children, and only a negligible number of women went for antenatal checkups. Of those who came for antenatal checkups, the primary reason for their visit was to obtain the tetanus toxoid vaccination. The main reason women did not visit the clinic for antenatal checkups was because they were not aware that the services were available at the health post.

- During monthly meetings at the Family Welfare Bureau, there was little discussion regarding ANC and anemia ACP. However, it was noted that the Family Welfare Officer emphasized the need to improve monitoring efforts.

Phase IV - From Program Implementation and Evaluation to Advocacy: The Next Step
Advocacy efforts were initiated in the State Government to understand the government's viewpoint regarding the importance of anemia control for reproductive and child health (RCH). The researchers invited the Government of Gujarat (GOG) Health Department official and UNICEF (Gujarat) to assist them in making a video entitled Anemia Control in Pregnancy. Their detailed comments were incorporated into the script for the video. The officials were also invited to appear in the video to impart actionable messages to health workers and supervisors at all levels on behalf of the government; while maintaining the overall goal of improved field level implementation and improved quality of care of the ACP. The video was shown at a dissemination workshop where results of the health systems research study were shared with government and NGO personnel, as well as staff of academic departments of M.S. University of Baroda.

V. Key Conclusions Regarding Lessons Learned:

- Diagnosing problems in a nutrition program is easier in a government system than correcting it and bringing about long-term, comprehensive improvements.

- Several parallel efforts, often funded by different donor agencies, combat the same problems without convergence and coordination, resulting in inefficient use of financial, material, and human resources. For example, in the Government of Gujarat, anemia control is an important component in the Reproductive and Child Health Program, the Safe Motherhood Program, ICDS, and the Micronutrient Initiative. Advocacy efforts should focus on the need for coordination mechanisms to ensure effective use of resources available for nutritional improvements in target groups.

- Nutrition researchers might make a greater contribution by working in partnership with program implementers for a sufficiently long period, with the required flexibility, using a holistic health system approach and understanding the intricacies of its functions.

- Policy and program personnel at all levels are more likely to move at a faster pace towards program goals of reduced maternal morbidity and mortality, improved maternal health, and improved nutrition if they truly integrated all components of a program at the field level and closely monitored all services including nutrition programs.

VI. Publications:

- Shubhada Kanani et al., *Nutritional Anemia: A Problem in Search of a Solution…Even Today*. Vadodara, India: John Snow, Inc., MotherCare, 1998.

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Prevention and Control of Anemia in Pregnant Women and Adolescent Girls in Rural Areas of Haryana, India

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Collaborating Agency: Survival for Woman and Children (SWACH) Foundation

Project Period: June 1995 - September 1998

I. Background:

In India there is a national anemia control program that provides for the distribution of iron and folic acid tablets during pregnancy. An evaluation of India's iron supplementation program indicated that a substantial proportion of pregnant women do not receive iron-folate pills. Women who received the pills initially often discontinued the therapy due to supply problems when refilling their tablets and side effects. While there is a program that addresses anemia in pregnant women, there is no program that addresses anemia in adolescent girls. The evaluation found that medical officers did not have sufficient knowledge of the iron supplementation program. Thus, despite the existence of this program, anemia among pregnant women has not been adequately controlled. It can be concluded that while the technical knowledge and components exist for the prevention and control of anemia, there is not enough experience in effective and efficient implementation of such a program.

The study was conducted in a community development block of the Yamunanagar District in Haryana, India, which covers 80 villages with a total population of 140,000. The health infrastructure of the study area consists of 1 community health center (CHC), 3 primary health centers (PHCs), and 23 sub-centers. The CHC and PHC facilities are equipped to examine blood for hemoglobin levels, perform slide examinations for malaria detection, and examine stool samples for hookworm infestation. These health centers provide routine antenatal care, delivery services, and referral support for pregnant women. The sub-centers are responsible for registering pregnant women, providing tetanus toxoid and iron folic acid supplements, and rendering family planning advice and services.

The government health program is supported by the Mahila Swasthya Sangh (MSS) scheme. These are village-based health groups comprised of volunteer women, an Anganwadi worker, and a schoolteacher. There are 31 MSS established in the block.

II. Study Objectives:

The objectives of this operational research project were to prevent and control anemia in pregnant women and adolescent girls in a rural population in Haryana, India by:

- Assessing the prevalence of anemia and its causes in pregnant women and adolescent girls.
- Improving the awareness of the causes, consequences, and treatment of anemia among different levels of health functionaries, pregnant women, and adolescent girls.
- Improving the coverage and compliance of iron- folate supplements by pregnant women using a combination of IEC strategies and preferred choices of types of iron supplements.
- Improving the detection of anemia in pregnant women at different levels of health care by examining the validity of currently recommended screening tools.
- Reducing the prevalence of anemia in pregnant women through counseling and improved iron supplementation.

III. Study Strategies:

A. Preparatory Phase

1. Behavioral study

During the preparatory phase, a behavioral study was carried out to understand knowledge and practices of health care providers and the community. Knowledge, attitude, and practice (KAP) studies, focus group discussions, and ethnographic studies were performed at baseline (as well as during the evaluation phase), using pregnant women (360), lactating women (122), adolescent girls (224), school teachers (60), Anganwadi workers (60), TBAs (3), and MSS members (5) as key informants. The results of the behavioral study were used to prepare the training and communication materials for the intervention.

2. Dietary recall

512 subjects (211 pregnant, 101 lactating women, 100 school-going adolescent girls, and 100 non-school-going adolescent girls) participated in a 24-hour dietary recall study that recorded dietary habits, intake of iron and vitamin-C rich foods, general cooking practices, and consumption of iron inhibitors in the diet such as tea and coffee.

3. Anemia prevalence

To assess the prevalence of anemia, 11 camps were set up in the project area. The field investigators made home visits to give registration slips to the target group one day prior to the camp. These camps were arranged in PHCs, sub-centers, or schools in the villages.

The women and girls were screened for anemia by physical examination of pallor at different sites (conjunctiva, nails, lips, tongue, and palms). The assessment was recorded as no pallor, probable pallor, and definite pallor. Physical examination was followed by quantitative estimation of hemoglobin using the cyanmethemoglobin method. Anemia categorization was defined according to WHO recommended cut-off points: Hb $\geq$ 11g/dL, no anemia; 10 g/dL $\leq$ Hb $\leq$ 10.9 g/dL, mild anemia; 7 g/dL $\leq$ Hb $\leq$ 9.9 g/dL, moderate anemia; and Hb $<$ 7 g/dL, severe anemia.

4. Compliance to iron therapy

A total of 317 women (130 pregnant, 187 lactating) were randomly selected for this component. The respondents were asked whether they had collected and consumed IFA tablets, and the number of days they had consumed tablets. Compliance for this study was defined as consumption of IFA tablets in appropriate doses (1-2 tablets/day) for an adequate length of time (3 months).

B. Intervention Phase

1. Development of IEC materials

A trainer's manual, learner's manual, flip book, and leaflet were developed to address the needs of different levels of providers and communicators. These IEC materials contained detailed information on signs, symptoms, causes, and management of anemia.

2. Training of health care providers

The baseline survey indicated that health providers had limited skills to diagnose anemia or to provide correct treatment, and they lacked confidence to provide mothers with counseling services. A plan was developed to train health functionaries at the following levels:

- Medical Officers (MO)
- Auxiliary Nurse Midwives (ANM)
- Anganwadi Workers (AWWs)
- Traditional Birth Attendants (TBAs)
- Mahila Swasthya Sangh (MSS) Members

Topics covered during these training sessions included definition and causes of anemia, signs and symptoms, vulnerable groups, prevention and treatment (dose and duration of iron supplementation), iron-rich and vitamin-C rich foods, and methods to improve IFA compliance. The possibility of planting lemon trees in households to improve the availability of vitamin-C was also discussed.

3. Social marketing approach

The social marketing program was designed and implemented with the following objectives:

- To promote intake of iron folate supplements during pregnancy.
- To raise awareness among pregnant women of the importance of taking iron supplements.
- To identify depot holders for iron folate supplements (apart from the government supply) in villages within the project area.
- To provide information on how to increase the bio-availability of iron.

4. Improving compliance to iron therapy

Counseling of schoolteachers and adolescent girls was undertaken in 8 government high schools. All the girls from 8^{th}, 9^{th}, and 10^{th} standards/grades (between the age of 13 – 17 years) were given this orientation. The training methods included lectures, story-telling, clinical photographs on anemia, role-play, group discussions, drills, and question and answer sessions.

School-going girls provided Personally Observed Treatment (POT) to the anemic pregnant women in the villages. Trained in the different preventive aspects of anemia control, each girl was assigned a moderately anemic pregnant woman. The girl would give one IFA table to her before going to school in the morning and one when returning from school in the evening, and record the daily compliance

on a card. At the end of 3 months of regular consumption of IFA, hemoglobin levels were checked to record the increase following treatment.

C. Post-Intervention Evaluation Phase

Pre- and post- surveys were the same and included:

- Evaluation of knowledge of providers
- Assessment of increase in the level of awareness in the community
- Change in prevalence of anemia
- Increase in hemoglobin levels following compliance.

IV. Project Outcomes:

A. Anemia Prevalence

In pregnant women (n= 307), a marginal decline in overall incidence of anemia was observed during the evaluation phase (78.4%) as compared to the baseline (84.0%). However, a significant decline was noticed in the prevalence of severe anemia (20.5% of baseline versus 16.8% post-intervention), indicating a shift from severe to moderate anemia.

Among lactating women (n=100 baseline, n=132 post-intervention), it was found that 90% were anemic (Hb < 11 g/dL) at baseline, with 69% having mild to moderate anemia (Hb 7-10.9 g/dL) and 21% having severe anemia (Hb < 7 g/dL). The post-intervention evaluation revealed a decline in those with severe anemia to 8.4% of lactating women were severely anemic and 96.0% were moderately anemic. Once again a shift from severe to moderate anemia was observed.

Two hundred and eighteen (218) school-going adolescent girls (SGAG) and 206 non-school-going adolescent girls (NSGAG) were investigated for hemoglobin levels during the baseline survey. At baseline 80.8% of SGAG were found to be anemic as compared to 90.3% of NSGAG. The SGAG with severe anemia was 3.2% in contrast to 11.7% severe anemia in NSGAG.

During the post-intervention evaluation phase, 111 SGAG and 153 NSGAG were investigated for hemoglobin levels. In SGAG, only 0.9% were severely anemic and 70.2% were moderately anemic, whereas in NSGAG 3.2% were severely anemic and 71.2% were moderately anemic.

B. Knowledge, Attitude, and Practice (KAP) Survey

A total of 826 and 620 KAPS among healthcare workers, pregnant and lactating women, adolescent girls, and schoolteachers were done during baseline and the post-intervention evaluation phases, respectively. At baseline, 96.6% of the health workers mentioned IFA to women as a form of treatment for anemia. After the intervention 21% of the health care workers also gave advice to anemic women about the intake of green leafy vegetables. A few of them also suggested jaggery or "Gur" as a part of the treatment of anemia. There was also a marked change in giving advice to the women about iron-rich foods. The AWWs were also able to identify pregnancy and lactation as the vulnerable periods for high prevalence of anemia after intervention. Almost all girls were aware of iron-rich foods after the intervention as compared to only 11% during the baseline survey. Green leafy vegetables were mentioned by 92% of SGAG and 87% of NSGAG. Jaggery was also stated as rich in iron by 42% of SGAG as compared to 29% of NSGAG.

V. Key Conclusions:

- There must be an adequate supply of IFA tablets and distribution depots to meet the demands of the anemic women and girls at all times.
- Awareness of the community regarding anemia has increased.
- Knowledge of iron-rich foods like jaggery and black gram has increased.
- Long-term follow-up action is required to ensure that clients sustain their kitchen gardens and planting of lemon and guava treesfor improved absorption of dietary iron.
- Efforts are needed to curtail the consumption of tea, especially after meals.
- AWW and other Mahila Swasthya Sangh (MSS) members are potentially good depot holders to increase accessto iron supplements.

VI. Lessons Learned:'

- Although pregnant and lactating women, adolescent girls, schoolteachers, and health care workers may not refer to anemia by its clinical name, the in-depth qualitative research revealed that a local term exists to explain anemia but it is confused with "general weakness". Even in cases of severe anemia, the appreciation of its severity and ill-effects on the mother and baby were not considered an illness to be taken seriously enough for medical attention. This signals the need for further education and anemia prevention activities at the community level.
- The approaches used served as an excellent vehicle to initiate discussion of anemia with pregnant and lactating women and adolescent girls.
- The 24-hour dietary recall method proved a reliable technique in gaining insight into the daily intake of women and adolescent girls. Their diets are deficient in iron and vitamin-C and far below the recommended daily allowances.
- The compliance with intake of IFA can be improved by training health care workers in counseling techniques. Involvement of adolescent girls in POT established the potential role these girls can play in the control of anemia.

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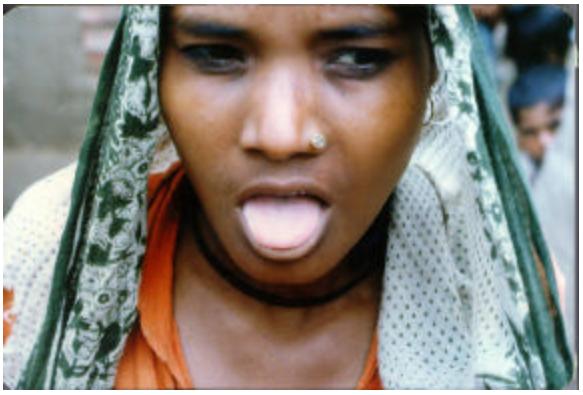
Distributing iron in many forms-syrups, capsules and tablets

Schoolgirl providing Personally Observed Treatment (POT) to an anemic pregnant woman



Looking for anemia!

Reducing Maternal Anemia through Community Participation: Bangalore, India

Primary Investigator: Dr. Chitra Stephens

Collaborating Agency: Department of Community Health, St. John's Medical College

Project Period: January 1997 – August 1998

Background:

Anemia prevalence among pregnant women in India is estimated at an alarming 88% (WHO, 1992). In 1994 the Government of India reported that 19% of maternal deaths in India were due to anemia. Anemia is also a contributory factor to the other major reported causes of maternal deaths such as hemorrhage (24%) and sepsis (8%) (Government of India, 1994).

Dietary inadequacy, especially of iron and folic acid, is a major determinant of anemia. According to the Indian Council of Medical Research, a normal Indian vegetarian diet contains 18-22 mg of iron, which represents only 58% of the recommended 40-60 mg of iron during pregnancy (1989). This is based on 10% absorption rates in order to provide the requisite 4-6 mg. Although absorption of iron is increased in pregnancy, supplements remain mandatory during this vulnerable period.

The impact of the Government's Reproductive and Child Health Program, which distributes iron tablets to pregnant women at no charge, has been limited due to poor supply and distribution of supplements. The latter is believed to be due to a lack of effective contact between most pregnant women and health service personnel (Shah U., 1984). However, the lack of awareness on the part of the community and the lack of motivation among the government peripheral health worker may also play a major role.

A strategy shown to successfully counter the problems of coverage and compliance in terms of iron supplementation in pregnancy has been the use of health workers from within the community for screening, treatment of anemia, and provision of nutritional advice. Several studies from other parts of the developing world have shown that acceptable compliance rates have been achieved when traditional birth attendants and other members of the community who share the same cultural beliefs as the recipients are enlisted as iron suppliers (Schultink and Dillon, 1998). High rates of iron tablet consumption have also been linked to the way these supplements were distributed – the higher rates being among women who received iron from traditional birth attendants (TBAs) during house visits (Utomo et al, 1993). These caregivers also provide support to the mother during the first few weeks of supplementation and advice on when best to take the tablets to minimize side effects. Therefore, the researchers hypothesized that a program which emphasized decentralized distribution of iron supplements by community volunteers would result in decreased prevalence of anemia and an increase in the mean blood

hemoglobin levels among pregnant women in a selected population within Karnataka State, India over a period of 18 months.

Study Objectives:

1. Conduct a baseline survey to:
- Determine the prevalence of anemia, its causes and associated risk factors;
- Assess the levels of iron consumption during pregnancy; and
- Study factors affecting the iron supply and distribution system.

2. Conduct formative research utilizing a variety of qualitative methodologies to:
- Determine behavioral factors affecting women's consumption of iron supplements during pregnancy;
- Identify barriers to optimal distribution of iron supplements by the public health system; and
- Develop appropriate and effective IEC materials and methods for improving knowledge and awareness of anemia prevention and control in the target populations.

Study Strategies:

Research Design
The study was a field intervention trial comprised of an intervention and control group, each consisting of rural and urban areas:

	Control		***Intervention***	
Rural				
PHC Area	Anekal	Dommasandra	Anugondanahalli	Sarjapura
Population	27200	22000	42900	22000
Urban				
Slum Area	Rajendranagar		Adugodi	Lakshmanraonagar
Population	15000		3500	8000

Research Hypothesis
The **decentralised distribution** of iron supplements by **community volunteers,** with the participation of the community will result in a **fall in the prevalence of anemia** as judged by a **rise in the mean blood hemoglobin** levels in pregnant women in a selected population in Karnataka state, India over a period of eighteen months.

A sample size of 100 per group will have adequate power to detect a change in the prevalence of anemia in pregnant women from 75% to 50% at a significance level of $\alpha = 0.05$ (1 tailed test).

In the rural intervention areas with a Crude Birth Rate of 27 per 1000, the total number of pregnant women that needed to be sampled in each group was 200. Given that the study was only 3 months, all women in the area at the time were included in the baseline survey in the intervention area. The total number of pregnant women in a population of 64,900 with a CBR of 27 per 1000 is 27 x 64.9 = 1752 per year. Similarly a comparable sample size was available in the control area which had a total population of 49,200 and comparable Crude Birth Rates.

In the urban slums, a minimum of 100 pregnant women would be available at baseline in each of the groups for the urban areas (pop = 11,500 and 15,000 in intervention and control respectively), based on a Crude Birth Rate of 30 per 1000.

A baseline survey was conducted using a structured interview instrument, followed by hemoglobin estimation using the micro-hematocrit method (capillary blood was collected using finger prick method into heparinised glass capillary tubes which were subsequently centrifuged. The hematocrit reading was obtained by placing the tube against a standardized scale). This was carried out in both intervention areas (n = 541) and control area (n=511). The qualitative research phase of the project was administered in the intervention area only.

Study population
The study was performed in the areas served by two Government Primary Health Centers (PHCs), Sarjapur and Anugondanahalli. The areas have a combined population of 75,596, are geographically contiguous, and are uniform in terms of socio-demographic characteristics. Agriculture is the main source of income and most of the population work as daily laborers earning 50 to 90 Rupees (men) and 40 Rupees (women) per day. (1 Rupee = 2.5 US cents)

B. Data Collection
Baseline quantitative survey
Following the guidelines for sample size as mentioned above, an attempt was made to identify the total number of pregnant women in all the villages under the 2 Primary Health Center areas of Sarjapura and Anugondanahalli. This was done mainly through antenatal registers maintained at the Govt. health centres and Govt. health functionaries (Junior Health Assistant - Female) and with the help of traditional birth attendants (TBAs), local women's groups and community leaders. The women were visited in their homes where the interview and hemoglobin tests were carried out.

Qualitative research
Social mapping was used in the first phase of the qualitative research to identify panchayat leaders and TBAs. Community volunteers and pregnant women within the community who could be potential candidates for key informant interviews were identified. Other research methods used were the Venn Diagram, free listing of ailments during pregnancy, severity ranking, preference ranking of service provider, case studies, and direct observation.
Key informant interviews (KIIs) were performed with pregnant women, TBAs, junior health assistants (JHAs), primary health care medical officers (PHCs), the additional directors, and employees from the Department of Maternal and Child Health and Family Welfare of the

Government of Karnataka. The goal was to gain information about the various factors that affect the existing iron program both from the point of view of the pregnant woman and the health care provider.

Study Results:

A. Baseline Survey

Anemia prevalence (Hb<11 g/dL) among pregnant women in the baseline survey (N = 1052) from a combination of urban and rural households was 60.4%. The mean Hb was 10.33 g/dL ± 1.68. Risk factors for anemia in this population were illiteracy and employment as agricultural laborers (in contrast to women who did not work outside the home). Knowledge of the definition, causation, and potential impact of anemia on the mother and infant was low, ranging from 0.5 to 10.5% of respondents able to give correct answers. 69% of pregnant women reported receiving iron supplements during the current pregnancy, with slightly less than a third purchasing iron from the private sector, and slightly more than a third receiving them free of charge from the government health services. Adequate dosage of iron per pregnancy was a problem with only 16.7% of pregnant women reporting consumption of >100 tablets. The impact of increased consumption of iron was evident in the mean hemoglobin of women: among women consuming <100 tablets, mean Hb = 10.24 g/dL. In contrast, among women consuming >100 tablets, mean Hb = 12.30 g/dL ($p<0.009$). When questioned about reasons for not consuming iron supplements during their current pregnancy, only 3.5% of women spontaneously cited gastrointestinal or other side effects of the tablets.

B. Supply and Distribution

Stockouts of iron supplements at central supply levels within the state are frequent. Supply problems are further compounded by transportation bottlenecks, which delay the arrival of iron to the PHCs and then to the JHAs. In addition to the above, the JHA does not appear to adequately fulfill her role as distributor of iron. This may be due to her multipurpose role within the health care delivery system which entails her implementing numerous, varied national health programs.

C. Behavioral Determinants

Within the community, pregnancy is considered a normal process, not to be accorded any special status. Complaints during this period are therefore not attended to with great alarm. Anemia as a distinct disease entity does not rank high in the list of problems during pregnancy. However, it is clear that its effects, called *susthu* (a term describing a feeling of tiredness/fatigue/weakness) in the Kannada language, are considered to be an important and troublesome set of conditions.

Formative research elucidated the fact that many women prefer to go to a private practitioner, and not to the public health system services. This is due in large part to poor quality/poor treatment by public sector health staff. One study participant stated that, "They (private doctors) understand Telugu and also talk nicely to us." This information will be used for the IEC intervention phase of future projects in which special sessions will be held for the surrounding private practitioners to ensure that when women do come for complaints of *susthu*, anemia diagnosis and treatment are implemented. An orientation to the existing government anemia control program is necessary for private practitioners to ensure correct dosage and duration of supplementation.

Additional results demonstrated inadequate counseling by health workers resulting in women's lack of understanding about the rationale for consuming iron supplements during pregnancy. Women expected to experience a cessation of the symptoms of anemia immediately, and were disappointed

that they continued to have them after a short period of tablet consumption. And the experience of their peers was highly influential in women's decision-making regarding consumption of/compliance with iron folate tablets: "The Health Center gave me red tablets to eat twice daily. But my sister told me she had bad stomach ache after taking the tablets. After hearing this, I did not even open my packet."

V. Intervention Objectives:

1. Select and train Community Health Volunteers (CHVs) with the assistance of the community. This would be achieved by motivating women's groups to select village level volunteers such as TBAs and other village level functionaries.
2. Establish an efficient distribution network through the CHVs. Women's groups will obtain supplies of iron supplements from the Government Primary Health Center and supervise the distribution of supplements by the volunteers in cooperation with the Junior Health Assistant (Government village-level functionary).
3. Assist the CHV in organizing IEC programs/campaigns to:

- Increase awareness of anemia and importance of iron supplementation among women;
- Improve compliance behavior with iron supplements;
- Increase dietary intake of iron-rich and vitamin C-rich foods; and
- Promote birth spacing.

4. Assess the impact of the project and transfer responsibility of the program to local groups in order to foster community ownership and accountability.

VI. Intervention Strategies:

A. Identification and Training of Community Health Volunteers

- Community Health Volunteers (CHVs) were identified with special predetermined criteria (e.g. willingness and enthusiasm, being a mother, and having family approval) and with the help of women in the community, village leaders, and government functionaries. Traditional Birth Attendants were given priority and selected in many villages as they already enjoyed an excellent relationship with women in the community and were trusted caregivers during pregnancy.

Seven full-day training programs were held to equip the Community Health Volunteers (94 rural; 51 urban) the skills required to communicate with pregnant women and their families regarding iron supplementation and to motivate women towards better compliance.

B. Lessons Learned During Training of CHVs

1. Listen to them - The women identified highly practical means of carrying out various tasks; for example, making use of common meeting places such as the village well for education and awareness raising activities. The women in the community also know when someone becomes pregnant.
2. Involve government staff - A motivated government worker can add value to a training session by first outlining the government's existing program strategy and then by sharing her own experiences with iron supplementation efforts.

3. Traditional birth attendants - Choosing TBAs as CHVs wherever possible has been a good decision. They bring a wealth of experience, which they share in the form of anecdotes and stories of real life events. Their recounting of personal experiences with maternal death by hemorrhage (for example) bring an element of credibility to discussions and emphasize that these situations still do occur in close proximity to the CHVs homes.
4. Motivation is most important factor in success - Many of the illiterate CHVs were the most enthusiastic in their participation during training and proved to be among the best performers. They have found ways to maintain records through neighbouring school children or relatives.
5. Communication skills - Support the CHV trainees in their unique ways of communicating among themselves - they are more convincing in their counseling interactions if they utilize familiar methods.
6. Souvenirs - The use of a red rose as a introduction to the concept of iron replete blood for the CHV trainees became a talking point for communities when the women returned in the evening to their villages after training. Explaining why a red rose was given served as a platform for initiating a conversation about anemia with other people in the community.

VII. Results of Intervention

Number of villages in project area = 82
Number of pregnant women in the area = 647
Number of pregnant women currently being regularly monitored = 615

Table: Coverage with Iron

	Baseline Survey	As of August 1998
Pregnant women receiving iron from Govt. Hospitals or Primary Health Centres (%)	27.7	35.4
Pregnant women receiving iron from Govt. Health Worker (%)	9	0.3
Pregnant women receiving iron from Project Community Health Volunteer (%)	----	15.4
Pregnant women receiving iron from Private Doctors (%)	30	51
Pregnant women who have consumed more than 100 iron tablets (%)	16.7	92.8

As can be observed from the above table very few women received iron from the government health worker. This was mainly due to an acute shortage of iron throughout the state of Karnataka during this time. As the project design entailed iron tablets being taken from the Govt. Health Worker by the project community health volunteer (CHV), this part of the intervention suffered greatly because of the shortage. However, fearing a loss of interest among the CHVs, the project independently mobilized iron directly from the drug companies to enable the newly - established process of distribution to continue. This accounts for the 15.4% of women who continued to receive iron through the project intervention.

The other vital intervention of the project was creating a demand for iron through aggressive IEC strategies. This has resulted in the increased amount of iron being requested by pregnant women

from health care providers in both the private and government sectors. Among the government institutions only a few of the larger Taluk and District Hospitals continued to have some meager supplies of iron. Therefore figures related to this reflect pregnant women who have received antenatal care from these specific centres.

VIII. Key Conclusions:

- Anemia afflicts up to 60% of pregnant women in India.
- The Government has attempted to address this issue through the National Anemia Prophylaxis program, which has been in effect since 1971.
- Despite this coverage and compliance have remained issues of concern.
- This project demonstrated the effectiveness of utilizing community women as "Volunteers" who would participate in the distribution of iron thereby improving coverage.
- Health education and promotion of iron consumption through innovative IEC strategies was shown to generate demand for iron as well as improve compliance in terms of regular consumption.
- Supply and distribution system problems continue to play a major role in poor results of iron supplementation programs in India.

IX. Publications:

- *The Prevalence of Anemia in Women*: A tabulation of available information, WHO, 1992.
- National Child Survival and Safe Motherhood Programme, MCH division, Dept. of Family
- *Reducing Maternal Anemia through Community Participation*. Dept. of Community Health, St. John's Medical College. Bangalore, India 1998.
- Shah, U. et al. *Using Community Health Workers to Screeen for Anemia*. World Health Forum, 1984. 5: 35-36.
- Utomo Budi, Pandu Riono, Teguh Budiono, Endang L.Achadi, Gouranga Dasvarma, Mary J. Hansell, Nancy L. Sloan, James Phillips, David Leon, and Carolyn Hessler-Radelet, Center for Child Survival of the University of Indonesia. The Alleviation of Maternal Anemia in Indramayu Regency, Indonesia: Results from the MotherCare Project. MotherCare Working Paper #23. Arlington, VA: John Snow Inc., 1993.
- Welfare, Ministry of Health and Family Welfare, Govt. of India, January 1994.

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Skit demonstrating advice on anemia presented to a pregnant woman

Community Health Volunteer training group

Anemia in Pregnancy: Impact of Iron Supplementation, Deworming, and IEC

Investigators:	Rajaratnam Abel Jolly Rajaratnam V. Sampathkumar
Collaborating Agencies:	Rural Unit for Health and Social Affairs (RUHSA), Christian Medical College and Hospital (CMCH), Vellore, Tamil Nadu
Dates of Intervention:	June 1996 – August 1998

I. Background:

The prevalence of anemia among pregnant women in various developing countries ranges from 35% to 75% (WHO 1992). Among the countries studied, the prevalence of anemia was highest in India. The Rural Unit for Health and Social Affairs (RUHSA) Department of Christian Medical College and Hospital in Vellore, Tamil Nadu has been providing maternal and child care as part of its comprehensive health and development program since 1977. In working to increase the awareness of women on health related issues, RUHSA realized the need to address anemia within the population of pregnant women and adolescent girls in its catchment area.

In an effort to assess anemia prevalence and implement a pilot project to reduce iron depletion and prevent anemia, an intervention was developed to measure the effectiveness of iron supplementation, deworming, and IEC. The intervention was assessed using a two-group pre/post-test experimental study design. The study area women received a supply of daily iron supplements (ferrous sulfate tablets containing 60 mg elemental iron) beginning in the fourth month of pregnancy. They were dewormed after completing 12 weeks gestation and received education and counseling from trained Family Care Volunteers. Control area women received only the routine, government health service inputs. A baseline survey of anemia prevalence among adolescent girls was also conducted.

II. Project Goals and Objectives:

To reduce the prevalence of iron deficiency anemia (Hb<11 g/dL) among pregnant women by 15% over 2 years by:

- Ensuring that at least 80% of all pregnant women consume at least 80 iron supplements during pregnancy;
- Promoting early consumption of iron tablets among pregnant women by ensuring at least 75% enrollment into antenatal care in the first trimester and 90% in the second trimester;
- Promoting awareness of anemia and its prevention using information, education, and communication (IEC) strategies; and
- Providing routine deworming during second and third trimesters to reduce the prevalence of hookworm (100mg Mebendazole twice daily for 3 days).

III. Project Strategy and Intervention:

A. Study population

Two geographical areas were selected for the experimental and control groups. These areas were located in Vellore District, in the Tamil Nadu State of South India. K.V Kuppam Block (*pop*. 110,000) was selected as the experimental area and Gudiyatham Block (*pop*. 130,000) as the control area. Both Blocks are similar in terms of socio-economic and geographical characteristics. In K.V. Kuppam Block, RUHSA and the Government primary health care program's Tamil Nadu Integrated Nutrition Program (TINP) supply iron and folic acid tablets to pregnant women. In Gudiyatham Block, non-governmental organizations that emphasize health, such as RUHSA, do not exist. Only the Government primary health care program and TINP implement health and nutrition initiatives. Iron and folic acid are supplied to pregnant women by these two programs.

Twenty panchayats (government administrative units within blocks) were randomly selected from both Gudiyatham Block and K.V. Kuppam Block. All pregnant women from the selected panchayats of both blocks were included in the survey. Alternate panchayats were randomly selected for surveying pregnant women and adolescent girls. The girls' age ranged from 13 –19 with a mean age of 15.6 years.

B. Data Collection

For the baseline survey the team consisted of 6 field workers, a lab technician, a supervisor, and an assistant project officer. Their role was to identify all pregnant women in their respective panchayats and ensure full coverage by conducting household surveys. Administration of the survey instrument was divided into two visits. At the first visit, the survey schedule was administered, followed by clinical screening for anemia. Measurements were collected for height, weight, and mid-upper arm circumference. Survey schedules provided the bulk of the quantitative information on socioeconomic variables, obstetric risk factors, and knowledge, attitude, and practice regarding maternal anemia (Abel et al., *Anemia in Pregnancy*, 1999). The initial interview and measurements lasted an average of 20 minutes. During the second visit, conducted the following day, a venous blood sample was drawn from the surveyed pregnant women for hemoglobin (Hb) and serum ferritin (SF) levels. In K.V. Kuppam Block, 522 samples were surveyed and hemoglobin levels were estimated for 464 subjects. A total of 260 samples were selected for SF estimation. In Gudiyatham Block 510 subjects were surveyed and blood was collected from 431 women for Hb and SF levels. In the control area, 211 samples were selected for SF estimation. Anemia was defined as Hb<11g/dL during pregnancy and SF< 12µg/L.

In the post-intervention data collection phase, the process was similar to the above. However, blood samples were collected on the same day of the interview and anthropometric measurements were not performed. There were 409 pregnant women interviewed in the study areas and 464 in the control areas. Blood samples were obtained from 403 (study group) and 425 (control group) women for hemoglobin levels. A total of 216 (study group) and 223 (control group) women gave samples for serum feritin levels.

Stool samples were collected from pregnant women (111 study area, 42 control area) and tested for the presence of hookworm ova during the post-intervention study. The deworming intervention was conducted among post-first trimester pregnant women for 15 months, after the project staff's concerns about possible teratogenic effects of anthelminthic agents were addressed.

The adolescents' baseline survey in both blocks was conducted in a similar manner, and the same field workers were used.

C. Data Analysis

The survey schedules were reviewed and edited daily by a supervisor to check uniformity among data collectors and to ensure completion and accuracy of the data. The data were coded using the Foxplus computer package. Data were analyzed using SPSS 5.0.

D. Intervention Method

Results from the baseline survey and formative research (conducted in 1996 to determine knowledge and behavior related to maternal anemia) formed the basis for program design in the study area.

1. Early Antenatal Registration and IFA Distribution

The intervention trained and supported Family Care Volunteers (FCVs) to identify and register pregnant women by the third month of pregnancy. Previously, the government registered pregnant women for antenatal care in the fifth month of pregnancy.

Iron tablets were distributed by a mobile clinic every week that services 18 Peripheral Service Units (PSUs) within the K.V. Kuppam study area. Each PSU has an average population of 5000 in which the FCV is responsible for an average of 200 households. All pregnant women were identified by the FCV and their status was reported weekly to the respective Health Aide (HA) who maintains the registers for every PSU. Sachets of 30 iron tablets were available free of charge in all the mobile clinics and distributed from the fourth month of pregnancy. Pregnant women were also encouraged to obtain iron tablets distributed by the Government Village Health Nurse (VHN), the health sub-centers, and the primary health care facilities in order to expand women's options for obtaining iron supplements.

2. IEC – Community Based Education Intervention for Behavior Change

Messages on anemia were developed through a participatory process involving all levels of workers and volunteers. Seven simple community-appropriate messages were developed that were easy for health workers to remember and disseminate. Information on anemia was printed on posters and distributed as a part of a mass media campaign. The following materials were used:

- Pictorial Flash Cards
- Educational Booklets
- Audio Cassettes (contained 8 songs about anemia accompanied by a commentary)

Various approaches were used to teach pregnant women and adolescent girls about anemia. For pregnant women, FCVs conducted personal education sessions (one-to-one education), group teaching in the community, and group teaching at the clinic. Health educators, nurses, and other staff conducted workshops in the community and schools for adolescent girls.

The general population received group education through videos displayed by the FCVs in homes and other locales throughout the community. Mass campaigns have been one of RUHSA's successful strategies for behavior modification in the various health issues they address. Their expertise in this area was also used for anemia control. Loud speakers were attached to a RUSHA vehicle and songs on anemia were played throughout the community. Heath educators, nurses, and students were used in broadcasting messages in the villages. Pamphlets on anemia were also disseminated among the general community.

3. Deworming

Pregnant women were issued mebendazole tablets in the mobile clinic routinely either in the second or third trimester. Each woman received six 100mg tablets with instructions to take one tablet twice daily for three days.

4. Monitoring

The FCV made field visits to each pregnant woman to confirm consumption of the IFA by counting the leftover tablets. During the later stages of the project, a monitoring card was issued to each pregnant woman in the clinic. The women were to maintain a record of their compliance by making tick marks on the card each time they consumed a tablet, returning the card to the nurse in the clinic every month. Supervisors also conducted field visits to monitor the educational sessions given to the women by the FCVs.

IV. Results:

The baseline survey revealed a 70.3% prevalence of anemia (Hb<11g/dL) at a gestational age of 24 weeks and above, and a decrease to 50.4% after the intervention (P<0.001) in the intervention community. By contrast, the prevalence of anemia increased from 68.2% to 75.5% in the control area (P<0.05). A significant difference of 19.9% (P<0.001) was observed in the post intervention assessment between the study and control area. When using serum ferritin levels as an indicator, the outcome was non-significant. The mean serum ferritin level increased from 23.31 to 25.69 μg/L in the intervention area and decreased from 24.45 to 22.09 μg/L in the control area.

Prior to the intervention, 39.2% of pregnant women in the study area were diagnosed with iron depletion (defined as SF<12 μg/L), which was reduced to 27.3% after the intervention. Using the cut-off of SF<15 μg/L, there was a significant decrease from 47.7% to 35.2% (P<0.01) in the study area. In the control area iron depletion increased from 32.7% to 35.4%. Iron deficiency anemia decreased significantly from 33.1% to 20.8% (P<0.01) in the study area when categorized by combining cut-offs of hemoglobin and serum ferritin levels (Hb<11g/dL and SF<12 μg/L). The percentage of women classified with no iron deficiency (Hb>11 g/dL and SF>12 μg/L) increased significantly in the study area from 24.0% to 46.3% (P<0.001).

Analysis of the impact of the various information materials demonstrated that pregnant women's knowledge of anemia occurred primarily through their exposure to flash cards on anemia (52.8%). Only 4.4% had seen the video, 3.2% heard the songs from the audio-cassettes, and 5.4% had read the messages in the pamphlets. Of the different communications strategies used for IEC, 39.1% learned about anemia through a one-to-one approach by the FCV using flash cards, 27.4% received their knowledge through group education in the clinic using flash cards and 4.2% learned about anemia through group education in the community.

The presence of hookworm ova in the stool of pregnant women was not assessed before the intervention. However, an assessment was made after the intervention in both study and control areas. A total of 111 samples from K.V. Kuppam Block and 42 from Gudiyatham Block were collected. Only 14.0% of pregnant women had hook worm ova in the intervention area in contrast to 43.8% in the control area. The difference in hookworm ova prevalence among pregnant women in the study and control areas was statistically significant (p<0.001).

Knowledge of the signs of anemia, iron supplement consumption, and hookworm infestation were significantly (P<0.001) higher in the study area than in the control area after the intervention.

V. Key Findings:

The study demonstrated a significant reduction in the prevalence of anemia and a corresponding increase in the mean hemoglobin concentration among pregnant women in a rural community setting. The intended outcome of this project was a decrease in the prevalence of anemia by 15%. The actual reduction was 18.9%. The study also demonstrated significant improvement in knowledge of the causes, consequences, and prevention of anemia and iron deficiency through multiple teaching methods and an intensive communications approach.

However, anemia prevalence continues to be a serious public health problem in South India and the need to expand successful efforts in community-based prevention and control among pregnant women is paramount.

VI. Lessons Learned:

- A team of multidisciplinary professionals ensures an effective output (doctors, nurses, researchers, statisticians, health educators, laboratory technicians, volunteers, etc.)
- IEC is effective for behavioral changes if the health services needed to achieve the desired behavior are available, affordable, and accessible.
- It is necessary to educate women about the purpose of giving any medication such as mebendazole or IFA. Repeated information encourages women to relate the medicine with the purpose.
- There is a need to include the role of anthelminthics during pregnancy to reduce anemia in the curricula of medical and nursing training.

VII. Publications:

Abel R., Rajaratnam J., Gnanasekaran V.J., Jayaraman P., *Prevalence of Anemia and Iron Deficiency in Three Trimesters of Pregnancy*. Accepted for publication in Tropical Doctor.

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Rajaratnam J., Abel R., Asokan J.S., Jonathan P., *Prevalence of Anemia among Adolescent Girls of Rural Tamilnadu*. Indian Pediatrics 2000 May 7; 37(5):532-536.

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Jolly R., Sampathkumar V., and Abel R., *Provider and Client Perspectives on Anemia: Data from India*. Tamil Nadu, India: 1998 RUHSA Department.

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IFA distribution through mobile clinic

One-to-one education: FCV with pregnant women

IEC materials (flashcards, pamphlets, audio and visual tapes)

Teaching a group of nurses in a mobile clinic

Malawi- Maternal Anemia Program

Collaborating Agencies: Project HOPE - Malawi
London School of Hygiene and Tropical Medicine
College of Medicine, University of Malawi

Dates of Program: 1995 - 1998

I. Background:

The MotherCare Project and its collaborators supported a program begun in mid-1995 to control maternal anemia in Thyolo District, Malawi. Although there are no national anemia prevalence data for Malawi, a 1994 Ministry of Health/UNICEF study of 715 pregnant women found that 66% were anemic.

The anemia program targeted two tea estates and surrounding villages in the Thyolo District. The total target population was approximately 100,000 with 20,000 of these residing on two tea estate compounds (Central Africa Company and Nchima Estate) and 80,000 residing in the villages surrounding these estates. Rudimentary health services were provided on the estates by the tea companies, while residents in the surrounding villages received services from the Ministry of Health.

The program took place in two phases. Phase I included the formative research necessary to define the anemia problem and the factors contributing to it (etiologic, behavioral and operational). Phase II consisted of a comprehensive intervention package based on the information from the formative research. Duration of the project was 33 months.

II. Project Goal and Objectives:

Phase I Objectives:

1. Determine the prevalence of mild, moderate, and severe anemia and the utilization of antenatal care in the impact area by conducting a baseline survey.
2. Determine the relative contribution of the various possible causes of anemia, such as iron deficiency, malaria, hookworm, nutritional intake or other factors by conducting an etiology study.
3. Determine constraints to utilization of iron folate tablets (IFA) by conducting qualitative research and a drug supply study.
4. Determine prices of key food items and the feasibility of making dietary recommendations in the intervention through a market study.
5. Determine the impact of mild anemia on the productivity and economic welfare of women coffee pickers.

Phase II Objectives:

1. Reduce the prevalence of mild/moderate anemia in pregnant and recently delivered women in the impact area by 50%.
2. Reduce the prevalence of severe anemia in pregnant and recently delivered women in the impact area by 30%.

III. Project Strategy and Interventions:

Iron folic acid (IFA) supplements were distributed to pregnant women and women within 30 days of delivery through antenatal and postpartum care services. A total of 75 clinical officers, medical assistants, nurses, midwives, health assistants and health surveillance assistants (HSAs) were trained on the importance of iron supplementation and the identification and management of side effects. Information, education and communication (IEC) messages were developed addressing the dangers of anemia, the importance of treatment, the identification and management of side effects, and the importance of early prenatal as well as post-partum care. These IEC materials were developed locally and included reminder cards for pregnant women, bags to carry the iron tablets, drama productions in the communities, and flip charts for health providers. Twenty-eight traditional birth attendants (TBAs) from villages were trained along with HSAs in order to facilitate their support of the TBA activities. The training addressed the distribution of IFA through the TBAs working in the communities.

IV. Project Outcomes:

1. Key Findings: Midterm Evaluation/ Monitoring Survey

A monitoring survey took place during February 1998, and reported a number of positive results attributed to the program interventions at the community level. All of the District Health Officers (DHO) interviewed felt that the Maternal Anemia Program had contributed to the increased attendance of women at antenatal care clinics, due in part to the more regular supply of iron supplements which clients valued and perceived as a central feature of care during pregnancy. Results from client exit interviews corroborated this assessment: 72% of women interviewed cited hospitals and health centers as the preferred site for antenatal care because of the availability of trained health providers who were equipped with IEC materials and adequate supplies through the Maternal Anemia Program. The program- supported drama group made up of health personnel, school children, and community members was cited as a particular strength of the education intervention. The main recommendation of the monitoring report was to increase the number of performances in the community to meet the demand for this popular activity.

Women reported high compliance with consumption of iron supplements; 86% of respondents stated that they took them as instructed. The vast majority of women were able to report possible solutions to help alleviate side effects of iron tablets based on the IEC materials developed by the Maternal Anemia Program. Among clients and community members, the vast majority of the interviewed group felt that the program was making an important contribution to the reduction of maternal anemia and that it should be sustained.

2. Key Findings: Final Survey

A final, community-based survey was carried out in June 1998, in which hemoglobin estimates were obtained to determine the impact of the intervention. From the baseline survey to the final survey, prevalence of anemia decreased and hemoglobin levels increased for pregnant and recently delivered women. These differences were only statistically significant for women who had delivered in the last 6 months and were mainly due to a reduction in moderate and severe anemia (see Tables 1 and 2). There was little difference in antenatal care (ANC) clinic attendance between the two surveys; however, the number of IFA tablets received significantly increased between the 2 surveys as reported by both pregnant

and recently delivered women.

Table 1. Anemia prevalence: Pre/Post Intervention

	% Prevalence of anemia (95% confidence intervals)		**Adjusted* odds ratio and p value**
	Baseline	**Final Survey**	***adjusted for age, parity, trimester of pregnant women and radio ownership**
Pregnant women (n=210)	66.7% (59%, 74%)	59.5% (51%,68%)	0.73 p>0.1
Women delivered in last 6 months (n=210)	61% (53%, 69%)	51% (44%,58%)	0.64 p=0.05

Table 2. Prevalence of anemia by severity of level

	Severe anemia Hb < 7g/dL	**Moderate anemia 7g/dL £ Hb < 9g/dL**	**Mild anemia 9g/dL £ Hb <11g/dL**	**Not anemic Hb ³11g/dL**
Pregnant women	Baseline: 3.3% (n=7) Final: 1.9% (n=4)	Baseline: 15.7% (n=33) Final: 14.8% (n=31)	Baseline: 47.6% (n=100) Final: 42.9% (n=90)	Baseline: 33.3% (n=70) Final: 40.5% (n=85)
	Severe anemia Hb < 8g/dL	**Moderate anemia 8g/dL £ Hb<10g/dL**	**Mild anemia 10g/dL £ Hb < 12g/dL**	**Not anemic Hb ³12g/dL**
Women delivered in last 6 months	Baseline: 4.3% (n=9) Final: 2.4% (n=5)	Baseline: 15.7% (n=33) Final: 8.6% (n=18)	Baseline: 40.1% (n=86) Final: 40.0% (n=84)	Baseline: 39.0% (n=82) Final: 49.0% (n=103)

3. Key Lessons Learned

An evaluation of the intervention was carried out in September 1998. The integrated package to address anemia through iron folate distribution with training and IEC led to more thorough service delivery and wider acceptance of the intervention at both the health center and community levels. People reported that knowing how to manage side effects helped them to continue taking the IFA tablets. Simple, locally developed IEC materials that focused on behaviors (bags for the IFA tablets and reminder-to-take cards) and local dramas that the majority of community members found highly effective as a method of communicating health messages were cited as helping to attach importance to taking the iron. The flip charts helped to remind providers of the main points to cover with respect to anemia.

Addressing anemia at both the community and health center levels led to improved availability and provider management of supplementation as well as better distribution and reported improved compliance. The TBAs who were interviewed knew the protocols for anemia reduction and management of side effects, and had the confidence of their villages. Women interviewed in the final survey believed that TBAs were an appropriate level for iron distribution. The intervention also increased multi-sectoral collaboration among partners and policy makers involved in anemia management. The development of an Advisory Committee brought the program to the attention of the government Ministry of Health and Population and later led to the formation of the National Anemia Task Force. The program also introduced

antenatal clinic services in one of the two estates that did not have such services. The estate had a total of five established ANC clinics by the end of the project.

V. Recommendations:

Future activities should focus on strengthening the community Primary Health Care (PHC) infrastructure (Village Health Communities, TBAs, HSAs, women's groups, village headmen, etc.) in order to promote community awareness of the need to reduce anemia. Further maternal anemia reduction efforts should be integrated into routine services under the oversight of the District Health Offices (DHOs) and Regional Health Offices (RHOs). Specific components might include improved iron distribution, IEC, and provider training on anemia management. The tea estates along with Tandizani Moyo, a local NGO in charge of overseeing and coordinating health activities for the nine estate companies managing tea estates in Thyolo District and Mulanje District, are in a good position to support anemia reduction activities in addition to their child survival mandate. This could be facilitated by encouraging the estates to continue their expanded role in health -- particularly preventive health -- service delivery.

Lack of consistent supplies of iron folate continues to be a problem in the program area. The solution to this problem should be considered in the context of essential drug procurement and distribution systems at the national level. Policy guidelines for prenatal care and the amount of IFA recommended for distribution during postpartum care need to be clarified at Regional and District levels. Where IFA is distributed for a fee, it is recommended that it be incorporated into the pre and postnatal package and included in the total cost to the client. The National Anemia Task Force should play a part in monitoring national iron supplies, advocating for anemia friendly policies, reviewing and disseminating information, and coordinating key stakeholders in anemia reduction.

1. Information Dissemination

A dissemination meeting was held in Blantyre, Malawi in September 1998. Participants in the meeting included representatives from the Ministry of Health, a tea estate, College of Medicine, College of Nursing, College of Health Sciences, Save the Children/USA, the Safe Motherhood Project, Thandizani Moyo (NGO), Wellcome Trust, as well as Project HOPE/Malawi and USA and JSI/MotherCare/USA. The workshop summarized the Maternal Anemia Program and highlighted the following points.

- The program underscored the problem of anemia during pregnancy and emphasized the socio-cultural determinants of iron deficiency. It demonstrated innovations in program delivery and the development of effective IEC materials and methods. The knowledge of and demand for anemia and iron prevention and control exist and compliance was shown not to be an issue.
- The program highlighted the difficulty of procurement of iron supplements as a chronic, persistent problem.
- Collaboration among the different participants (Ministry of Health, tea estates, communities, and health providers) takes time and effort to achieve. There is a continuing need to educate health providers, policymakers, pregnant women and mothers, and their communities about anemia.
- The dialogue during the dissemination meeting and the establishment of a National Task Force on Anemia indicates that there is support for working seriously to solve iron supplement supply and logistics problems.

2. Next Steps

Participants from the workshop were encouraged to take on the task for advocating for anemia control:

- at the national level, to urge that iron supplements are indeed part of the essential drugs package;
- to continue work on the supply system to address bottlenecks;
- to work with the central government to implement the iron fortification of flour or salt;
- not to forget diet-based education, including avoidance of iron absorption inhibitors and the increased

consumption of foods which promote iron absorption;

- to take a life cycle approach to iron deficiency, anemia prevention and control; and
- to continue to frame research questions that will help to further substantiate the fact that iron supplementation is an extremely cost-effective intervention.

VI. Publications:

Kachingwe S, Mbweza E. An Evaluation of the Maternal Anemia Program. Project HOPE, March 1998.

Levene M, Williams L, Mills A, Kaonga M, Franco C. *The Impact of Mild Anemia on the Productivity and Economic Welfare of Women Pickers on a Coffee Estate in Thyolo District, Malawi*. Draft publishable article.

Rubardt M. *Reduction of Iron Deficiency and Anemia in Women of Reproductive Age in Malawi, Final Evaluation Report*. Subcontract 5024-128. Millwood, VA: Project Hope, September 1998.

Walford, C. *Proceedings of the Maternal Anemia Dissemination Workshop*. Blantyre, Malawi: Project HOPE/MotherCare, Subcontract 5024-39. September 1998.

Williams L, Namate D, Kachule T, Chirombo F. *Reducing Iron Deficiency and Anemia in Women of Reproductive Age, Thyolo District Malawi: Report of Final Survey*. MotherCare, August 1998.

Williams L, Semu L, Behague D, Chakunja S, Franco C. *A Qualitative Study of Constraints to Reducing Iron Deficiency and Anemia in Women of Reproductive Age in Thyolo District, Malawi*. MotherCare, 1998.

Williams L, Sibale C, Cousens S, Franco C. *Reducing Iron Deficiency and Anemia in Women of Reproductive Age in Thyolo District, Malawi – Report of Baseline Survey*. MotherCare: March 1997.

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Woman with her child during an interview

Tea estates at foot of Mount Amulanje

Woman's hemoglobin just measured using HemoCue

Anemia and Iron Deficiency in Adolescent Students in Lima, Peru: Causes, Consequences and Prevention

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Collaborating Agency: Instituto Investigación Nutricional (IIN) Lima, Peru

Dates of Intervention: August – December 1996

I. Background:

A national survey conducted in Peru in 1996 found that 36% of women of reproductive age and 57% of children under 5 years of age suffer from iron deficiency anemia (Encuesta Demografica y de Salud Familiar, 1996). In Lima, 50% of pregnant women are anemic during pregnancy (Zavaleta et al, OPS, 1994). Typical diets in Peru are based on cereals, roots, and legumes, which do not provide adequate sources of bioavailable iron. The most vulnerable groups to suffer from anemia are pregnant women and children under 3 years of age who cannot meet their higher iron requirements from this diet.

Iron supplementation is one of several strategies recommended to improve iron status among vulnerable populations. Although iron supplements are given to pregnant women receiving antenatal care at health centers, the prevalence of anemia remains high in Peru. In an effort to improve women's iron status before entering pregnancy as well as to alleviate the negative impact of iron deficiency and anemia on adolescent girls, experimentation with iron supplementation through the schools is beginning in several countries. This study in Peru aimed to assess the feasibility, efficacy and acceptability of reducing anemia through iron supplementation of adolescent girls in schools, using either a daily or intermittent dosing regimen.

II. Study Objectives:

- To assess the prevalence of iron deficiency anemia in a representative sample of adolescent school girls in Lima, Peru
- To estimate their levels of nutrient intake
- To estimate iron expenditures by menstrual losses in adolescent girls and the prevalence of menorrhagia in this population
- To assess the efficacy of an iron supplement administered as an intermittent dose to a group of adolescent girls

- To evaluate the impact of iron deficiency anemia on cognitive and affective variables through school achievement of adolescent girls
- To determine the levels of compliance to iron supplementation in school
- To understand the perceptions and attitudes of adolescent girls in relation to their nutrition, health, and iron supplementation

III. Study Components:

1. Assessing anemia prevalence

Anemia prevalence was assessed in a sample of adolescent schoolgirls (12-18 years old) from Lima, Peru. Subjects were selected in a two step sampling process. The schools randomly selected were Jose Olaya Balandra (public) in Chorrillos district, Francisco Bolognesi (public) in the district of Villa El Salvador, and San Jose de Clunny (private) in the district of Barranco. There were 381 girls who participated in the study and for whom there was a venous blood sample and anthropometric measures such as weight, height, and Body Mass Index (BMI).

Ten percent (10%) of girls were anemic (Hb<12g/dL) and anemia prevalence was similar among girls from all three schools. Hemoglobin was not correlated with weight, height, or BMI. Results from the serum ferritin tests found 25% of the girls to be iron deficient (SF<12µg/L).

2. Assessing nutrient intake

A subsample of 88 girls from the 381 girls who participated in the anemia prevalence survey was included in the nutrient intake assessment. These girls attended either Francisco Bolognesi (n=56) or San Jose de Clunny (n=32). A two-day consecutive 24-hour recall was taken to evaluate dietary intake. A food frequency questionnaire that asked about foods rich in iron and vitamin C was included in the survey.

Girls from both the private school (middle-high socioeconomic status) and public schools have diets that do not meet the recommended amounts of the following: iron, zinc, calcium, and thiamine. Public school girls' diets were also deficient in energy.

3. Estimating iron expenditures through menstrual losses and prevalence of menorrhagia

The sample of 381 girls who participated in the nutrition evaluation also participated in the study of iron expenditure. To estimate menstrual losses, girls were assigned a code and given pre-weighed sanitary pads and plastic bags with labels. Field workers weighed each bag daily. The menstrual losses for two consecutive periods were measured for each girl.

The mean and median loss of blood was 62.6 ml and 56.2 ml, respectively. These values are twice as high as those found in Sweden (30 ml) and Great Britain (26.5 ml). From these figures, the International Nutritional Anemia Consultative Group (INACG) estimates losses of 12.5 mg of iron per month. In this study, 25% of the girls had losses of >80 ml. There were no differences in age or among schools. The average age of menarche in this population was 12 years old.

4. Assessing the efficacy of iron supplements administered as an intermittent dose to adolescent girls

The study was a double blind placebo-controlled design in Francisco Bolognesi School. Three hundred and twelve (312) girls, ages 12-18, were randomly assigned to the 3 following groups.

1. Iron sulfate- 60mg elemental iron daily (M-F)
2. Iron sulfate- 60mg elemental iron taken two days in the week (M-F)
3. Placebo daily (M-F)

Supplementation was conducted for 17 weeks (August-December, 1996). Tablets were given at school between meals in the morning or afternoon for those who study during those hours. The field workers recorded the number of tablets and side effects reported by the girls.

Of the 296 girls who completed the study, it was observed that girls who received supplements had significantly ($p<0.05$) higher hemoglobin levels than girls in the placebo group. And girls who had taken a daily iron supplement had significantly ($p<0.05$) higher hemoglobins than those in the intermittent group. At the beginning of the study, the proportion of anemic subjects was similar in the three groups (19.8% in daily, 18.4% in the intermittent, and 15.5% in the placebo group). After the 17 weeks, the proportion of anemia in the daily group (10.9%) was lower than the placebo (22.7%) and the intermittent group (17.3%) ($p<0.05$). There were no differences in serum ferritin (SF) or free erythrocyte protoporphyrin (FEP) between the daily and intermittent groups at the end of the study. However, SF decreased significantly ($p<0.05$) in the placebo group.

The primary reason 16 girls did not complete the trial was due to school withdrawal; they moved to other cities or districts in Lima. Side effects were not a main reason to withdraw from the study and there was no difference in the 3 groups with respect to the occurrence of side effects (J. Nutr. 130:462S-464S, 2000).

5. Understanding perceptions and attitudes of adolescent girls in relation to their nutrition, health, and iron supplementation

A subsample of adolescent girls who participated in the iron supplementation study was asked about their perceptions and attitudes on nutrition, health and iron supplements. Twenty-eight adolescents participated in four focus groups. Specifically, the girls were asked about school and home, health problems, menstruation, anemia, and iron supplements.

Menstruation was considered to be a problem because of feeling tired, weak, with pains in the back, stomach, and waist. When asked about care during menstruation, the girls mentioned hygiene, and avoiding cold water, cold showers, and acidic drinks.

Girls were asked to describe a person with anemia. Some of their responses included sleeping all day, no appetite, poor performance in school, no participation in sports or social activities, and a pale appearance. Causes of anemia were poor diet, low hemoglobin, parasites, diabetes, and low calcium. Some girls related anemia to menstruation and said it is the reason women are more affected by anemia than men. The

treatment for anemia, as reported by the girls, is to eat well, eat a variety of foods such as fish, soups, and legumes, take vitamins with iron, avoid sweets, and play sports.

When asked about benefits and side effects of iron supplements, some girls mentioned they had headaches, felt tired and hungry, and had constipation at the beginning of the trial. However, these symptoms passed and they received support from the field team and the nutritionist to continue taking iron. Benefits from the tablets were improved appetite and school performance, feeling good, and one girl said that her hemoglobin increased.

Girls were asked what they thought about the iron tablet itself. Most said the size was fine. Although many girls did not like the taste of the tablet, and some thought the brown color of the tablet was strange, they did not stop taking the iron supplements.

IV. Study Outcomes and Conclusions:

- Iron deficiency is a nutritional problem that affects 25% of school-age adolescent girls within the study population in Lima, Peru; 10% of the study population was anemic with up to 20% anemic in the public school population.
- The girls' diet appears to be inadequate, especially in bioavailable iron foods, and does not meet the high iron requirements coming in part from heavy menstrual blood loss in this population.
- Iron supplementation delivered through the school and targeted to at-risk adolescents is an effective way to prevent anemia and iron deficiency, as well as to improve iron stores.
- Compliance with iron supplementation by school-going adolescent girls is very high if they are adequately motivated.
- Adolescent schoolgirls and teachers are willing to participate in interventions to prevent and control anemia.

As a follow-up to the intervention, IIN disseminated the results to the study participants, parents, school officials, funding agencies, and local leaders. Materials were developed to help publicize the results of the work.

IIN produced a book (Zavaleta et al. Anemia y Deficiencia de Hierro en Adolescentes Escolares en Lima, Perú. Causas, Consecuencias y Prevención) that summarized the placebo-controlled study findings and contained information on the prevalence of iron deficiency in school-going adolescent girls in Lima, which was presented at a public forum involving school authorities and local leaders. The book also addressed interventions to combat iron deficiency and its effects on school performance, self-esteem, and future areas of research and intervention. (The book is available on the IIN Web page, www.iin.sld.pe.)

Workshops were organized at the three schools using participatory methods to involve the students in identifying the causes and effects of iron deficiency anemia, as well as proposing prevention strategies. The conclusions of the workshops were published in a local newspaper's school page.

V. Recommendations:

- Develop and implement educational interventions on diet diversification and adequate combination of foods that can be integrated into the school curricula.
- Among very poor segments of the population, there are limited possibilities for obtaining a balanced diet due to factors such as economics, geography, culture, and lack of availability of iron-rich foods. Therefore, national and local programs should complement existing school-based food programs with fortified foods. These programs need continuous monitoring, and evaluation to determine the effectiveness of the intervention.
- Among some school-age girls with limited food availability, scarce resources, a high incidence of parasites, malaria, early pregnancy, and a lack of access to fortified foods, it is important to consider iron supplementation with folic acid and other micronutrients to prevent or correct anemia and other nutritional problems. In addition, any intervention needs an educational component, which includes counseling and information that will encourage and support the target population to take the supplements.
- Investigate the benefits of improving adolescents' iron status on school performance, attendance, and physical capacity.

VI. Publications:

Zavaleta N., Respicio G., and Garcia T., *Efficacy and Acceptability of Two Iron Supplementation Schedules in Adolescent School Girls in Lima, Peru*. J. Nutr. 130:462S-464S.

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An Intervention to Improve Dietary Iron Intake among Women and Adolescents through Community Kitchens in Lima, Peru

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	Tula Uribe	Mary Fukumoto
	Rosario Bartolini	Margaret Bentley

Collaborating Agency: Instituto de Investigación Nutricional

Dates of Project: September 1996 – May 1997

*I. **Background:***

Iron deficiency anemia (IDA) is the most prevalent nutritional problem worldwide, with women of reproductive age and children most vulnerable due to their high iron requirements of reproduction and growth. A national survey conducted in Peru in 1996 found that 36% of women of reproductive age, more than 50% of pregnant women (Zavaleta, 1997), and 57% of children under 5 years suffer from iron deficiency anemia (Encuesta Demografica y de Salud Familiar, 1996).

In order to increase the dietary intake of locally accessible, high bioavailability iron sources for adult women and adolescent girls, an educational intervention was developed by the Instituto de Investigacion Nutricional (IIN) and implemented through community kitchens (CKs) in the poor urban areas that surround Lima. Community kitchens were developed in the early 1980s in an effort to make greater use of locally available resources through communal cooking by a number of families in a period of difficult economic conditions. They are organized and run by women who prepare the food and menus, thus, increasing women's knowledge of a healthier diet and their informed decisions about their nutrition and health.

II. Study Objectives:

The nine-month intervention was designed to:

- Increase awareness of anemia among adolescent girls and women;
- To promote behavior change that leads to a balanced dietary intake rich in iron through culturally acceptable modifications of the community kitchen menus;
- Increase availability and accessibility of affordable iron-rich food sources; and
- Increase the dietary iron intake in adolescent girls and women.

III. Study Strategy and Interventions:

1. Ethnographic Research

Ethnographic research explored the knowledge and perceptions of the women and adolescent girls with regard to nutrition, health, anemia, self-esteem, the use of the CKs, and decision-making with respect to the selection of the CK menus.

The research strategy was designed to prevent anemia by increasing iron intake in adolescent girls (12 – 17.9 years of age) and non-pregnant women of reproductive age (18 – 40 years of age) before they enter pregnancy and lactation, as well as between pregnancies. The dietary strategies included increasing the

intake of low-cost foods rich in heme iron. Dietary strategies also focused on increasing the consumption of vitamin C rich drinks and salads (to aid iron absorption) with meals containing commonly consumed non-heme iron food sources such as beans. Because beans and liver were not very popular foods in terms of palatability, the intervention aimed to change women's and girls' perceptions of these foods and to encourage increased consumption of such available iron-rich foods.

2. Selection of Community Kitchens, Women and Adolescent Girls

Community kitchens were randomly selected from two geographically separate, yet characteristically similar (in socioeconomic status and dietary intake) communities, each containing 65 CKs. In order to obtain appropriate sample sizes, 8 CKs from one area were selected in the control group and 9 from the other area for the intervention group.

Adult women and adolescent girls were randomly selected from the lists of members and beneficiaries at each of the selected CKs. Between 7 and 18 adult women and 2-12 adolescents were selected from each CK, based on the following criteria: a) non-pregnant or non-lactating adult women ages 18 – 40, and b) adolescent girls ages 12 –17. There was a total of 96 adult women and 71 adolescent girls in the intervention group and 77 adult women and 65 adolescent girls in the control group at baseline. There were fewer participants in the final evaluation due to pregnancy, refusal of the second blood sample, and loss to follow-up (Intervention group: 77 women, 50 girls; Control group: 68 women, 42 girls).

3. Educational Messages and Materials

The development of an information, education, and communication (IEC) campaign using materials to raise awareness of anemia and diet was a key component of the intervention. The campaign complimented the menu changes and promotion of iron-rich foods in the community kitchens. All materials were developed and tested in local focus groups within the target population.

Mixed media material produced for the intervention included:

- Posters promoting a balanced diet and affordable heme iron food sources;
- A mobile to promote the consumption of lemonade with beans (the most commonly used non-heme iron source);
- Recipe booklets and menu preparation guides;
- Games and exercises with cards depicting familiar foods;
- Special folder for adolescents; and
- T-shirts, stickers, pencil cases, and rulers containing key campaign messages to increase iron intake.

4. Monitoring and evaluation

Weekly visits were initially made to the community kitchens to aid in the menu planning during the early project phase. Monitoring was conducted through interviews with the leaders of the community kitchens and the adult women and adolescent girls who participated.

The impact of the intervention was measured through a comparison of the baseline and final survey results from the control and intervention communities.

IV. Study Outcomes:

- Following the intervention, total iron intake increased significantly from 6.6 mg/day to 8.8 mg/day in adult women and from 7.7 mg to 9.4 mg in adolescent girls. There was no change in the control group.
- Significant ($p<0.01$) increases in intakes of heme iron and bioavailable iron were observed in both adult women (0.22 mg to 0.38 mg/day of heme iron and 0.31 mg to 0.47 mg/day in available iron)

and adolescent girls (0.21 mg to 0.66 mg/ day of heme iron and 0.36 mg to 0.50 mg/day in available iron). Again, there was no significant change in the control group.

- Prevalence of anemia did not change in the intervention communities (35% among adult women and 15% in adolescent girls). Anemia prevalence increased significantly ($p<0.01$) in the control communities from 27% to 41 % in adult women and 14% to 38% in adolescent girls. Although the reasons are not clear as to why anemia rates increased in the control communities, the researchers believe that this impact occurred from a nutritional decline in dietary menus of the community kitchens due to economic constraints. In contrast, the intervention had stimulated the purchase of low-cost heme iron sources and use of vitamin C with beans, which helped to protect the intervention community's iron status. There was a significant increase in knowledge of optimal diets and the prevention of anemia in the intervention groups, particularly among the adolescent girls.

V. Key Conclusions Regarding Lessons Learned:

- Community kitchen leaders said that the educational intervention was a positive experience for them, adding to their menu planning skills for improved quality and variety of meals.
- All of the participating women valued learning about more nutritious food combinations. An important achievement of the intervention was women's change in their perceptions of liver and beans. These foods are now seen as nutritious and more versatile. The combination of drinks high in vitamin C, such as lemonade, with beans to increase iron absorption was well understood.
- The adolescent girls enjoyed the opportunity to learn about their nutritional well-being, and the exposure to different educational techniques and games used during the training. They grasped the nutritional concept of combining beans with lime, demonstrating a significant leap from their pre-intervention knowledge. Their increased knowledge about diet appears to have given the girls more self-esteem, made them more aware of the foods they eat, and has given them the self confidence to disseminate the new information to friends and family.
- The adolescent girls were highly motivated by the possibility of improved school performance from improved iron nutrition.
- Adolescent girls were more willing to implement dietary behavior changes than the adult women.

VI. Recommendations:

- Incorporating iron-rich foods into the community kitchens helped to improve the menus. There is a need to find ways to make these foods available to the community kitchens at affordable prices.
- This experience has shown that the diets of women and adolescent girls can be improved through the community kitchens, but the improvement must focus on the quality of the food.
- The motivation on the part of the adolescent girls to incorporate new knowledge into their selection of foods is positive. Their willingness to change behavior offers support for nutrition programs and interventions that focus on adolescent girls, with the promise of benefits both for them and their future families.

VII. Publications:

Creed-Kanashiro, H. et al., *Improving Dietary Intake to Prevent Anemia in Adolescent Girls through Community Kitchens in a Periurban Population of Lima, Peru*. Washington, DC: Journal of Nutrition 130: 459S – 461S, 2000.

Creed-Kanashiro, H. et al., Intervención Educativa para Mejorar el Consumo de Alimento Ricos en Hierro Y Prevenir la Anemia en Mujeres y Niñas Adolescentes a través de los Comedores Populares. Lima, Perú: Instituto de Investigación Nutricional, 1998.

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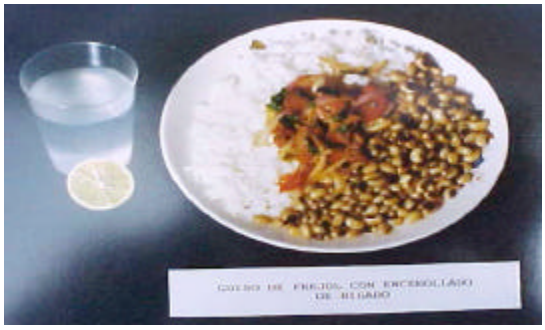
Women preparing food in community kitchen



Beans and rice with liver and lemonade

Poster featuring iron-rich foods

Adolescent girls with IEC materials from anemia intervention

Project Concern INTERNATIONAL PCI

Working with Traditional Birth Attendants to Improve Iron Tablet Utilization by Pregnant Women

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Additional funding: WHO/Geneva

I. Background:

An estimated 50 to 60 percent of pregnant women in Indonesia suffer from anemia (hemoglobin less than 110 g/l), increasing their risk of adverse birth outcomes. One of the major causes of anemia in Indonesia is inadequate intake of iron. While national policy has been to provide 90 iron tablets (containing 60 mg elemental iron) to approximately 50 to 60 percent of the pregnant women in Indonesia, supplementation has been complicated by a lack of knowledge regarding the importance of treating anemia, fears regarding side effects, lack of provider motivation to treat anemia, and difficulties with the distribution scheme. To improve this situation, a study took place in the Maluku Province, where 2 million people are spread over 1000 islands 70 percent of the villages are located more than 10 kilometers from a health center. This physical isolation is compounded by the fact that many women do not seek antenatal care even when accessible and most deliver with a traditional birth attendant (TBA).

An earlier University of Indonesia/MotherCare study in Indramayu[1], West Java, revealed that TBAs have the potential of increasing the consumption of iron/folate tablets by pregnant women through door-to-door distribution. Under this study the average number of tablets consumed during each pregnancy was significantly greater in the experimental area than the control area (64 vs. 23 tablets) and the proportion of pregnant women taking iron/folate increased. Hemoglobin levels were not obtained due to technical difficulties in the field. These results needed to be further verified under more normal field conditions and health impact confirmed with hemoglobin determinations. The present study was the logical next-step in assessing the feasibility of TBAs serving as the primary suppliers of iron/folate supplementation for pregnant women.

Recent work in Sri Lanka[2] suggests that decreasing the hookworm load in pregnant women enhances the impact of iron supplementation. The infestation rate with hookworm, whipworm, and ascaris is high in the Maluku study population, though worm load is moderate. Therefore, the study also looked at the effects of routine de-worming of the study population on their hemoglobin status.

This study also provided an opportunity to investigate the effect of a weekly (versus daily) iron supplementation regimen on pregnant women's hemoglobin status under field conditions. Concern that the occurrence of side effects diminishes women's adherence to a daily regimen has prompted experimentation with a less frequent dosage schedule. However, the efficacy of these alternative strategies has not yet been widely substantiated.

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[1] Moore, Mona, Pandu Riono, and Siti Pariani. *A Qualitative Investigation of Factor Influencing Use of Iron Folate Tablets by Pregnant Women in West Java: A Summary of Findings*. MotherCare Working Paper #13. Arlington, VA: John Snow Inc (1991).

[2] Atukorala, TMS, et al. Evaluation of effectiveness of iron-folate supplementation and anthelminthic therapy against anemia in pregnancy—a study in the plantation sector of Sri Lanka. *American Journal of Clinical Nutrition* Vol. 60: 286-292 (1994).

II. Study Goal and Objectives:

The goal of the Maluku study was to improve the health status of pregnant women by decreasing anemia. Objectives of the study include:

- Examining the capability and effectiveness of working with TBAs to improve iron/folate tablet distribution to pregnant women in rural villages with the specific objective of increasing the number of tablets consumed by the women and increasing hemoglobin levels;

- Determining whether the administration of two tablets of iron/folate per week in one dose is as effective in increasing hemoglobin levels as a daily dosage of one tablet (60 mg elemental iron); and

- Determining whether the combined and separate effects of iron supplementation with anthelminthic treatment can improve hemoglobin and iron status in women.

III. Study Components:

Out of more than 600 pregnant women enrolled in the study, 580 were followed for 12 to 20 weeks on three different iron supplementation regimens (see Figure 1, Iron Supplement Study Design). Group 1 (TBA-Daily) received a week's supply of 60 mg elemental iron/folate tablets to be taken once daily. The TBAs supplied and monitored the distribution and educated women on the importance of treating maternal anemia. Group 2 (TBA-Weekly) received two 60 mg iron/folate tablets once weekly. The TBAs provided the tablets and monitored the group, as well as conducted some health education. Group 3 (Control) received their iron/folate supplements at the health center during routine antenatal care visits and had no TBA input on supply or health education/monitoring. Baseline hemoglobin and ferritin levels were obtained for all study subjects with follow-up hemoglobin and random ferritin values checked after 12 weeks of therapy. Hemoglobin was also checked at the end of 20 weeks. HemoCue machines were used for hemoglobin determination and serum samples were analyzed for ferritin by the Southeast Asia Tropical Medicine Research Center (SEAMEO) in Jakarta.

Each of the three groups was then randomly divided into equal subgroups to receive, in a double-blinded fashion, either one 500 mg mebendazole tablet or placebo during the second trimester.

There were no significant differences among the three study groups in the number of total pregnancies, miscarriage rate, stillborn rate, birth intervals, average weight/ height, arm circumference, and weight gain after 12 weeks. The average age of the enrolled subjects was 26.6 years (range 16 to 44 years). The women were on average 3½ months gestation on entry into the study. Twenty-six percent of the subjects were primiparous; the rest having had an average of two previous pregnancies (range 1-9). Birth intervals were relatively short with 34.7 percent having delivered within 24 months of the current conception and 9.4 percent within the previous 12 months. While there were no statistically significant differences among the groups for common pregnancy complaints (e.g. dizziness, nausea), Groups 1 and 2 claimed higher worm infestation than the Control group and Group 1 a higher incidence of malaria and fever than the other two groups. Group 1 comes from an area with fewer health facilities than the Control area and has somewhat worse economic conditions, which may account for the difference in baseline anemia prevalence.

IV. Study Results:

- TBA-Daily (Group1) subjects consumed an average of 95 tablets during the 20-week course compared to 65 tablets in the Control Group (Group 3). Compliance in the TBA-Daily (Group 1) subjects (70%) was much better than compliance in the Control Group (Group 3) (47%). The

difference amounted to a total of 1800 mg more elemental iron consumed by the women in the TBA-Daily (Group 1) Group.

- TBA-Daily (Group 1) subjects had a 6.5 g/l increase in hemoglobin level over the 12 to 20 weeks treatment period versus a 7.5 g/l decrease for the Control Group (Group 3), resulting in a decrease in the proportion of anemic women in the TBA-Daily Group (Group 1) from 29 to 15 percent and an increase in the Control Group (Group 3) from 13 percent to 30 percent.

- Dose response determinations indicate that ninety, 60 mg elemental iron tablets are barely adequate to produce a significant increase in hemoglobin status and iron stores even when compliance is good. Consistent hemoglobin improvement requires 100 or more tablets consumed over 12 to 20 weeks.

- Results revealed that the daily-dose regimen was far more effective than the once-weekly regimen with two tablets. In order to control for variations in compliance, only women in the two groups with greater than 50 percent compliance were compared. The hemoglobin with the daily regimen rose 8.0 g/l versus only 2.4 g/l for the weekly group after 20 weeks of therapy.

- Ferritin, a measure of iron stores, dropped significantly in the TBA-weekly (Group2) and Control Group (Group3), but remained unchanged in the TBA-Daily (Group 1) Group. This provides evidence that daily iron supplementation was able to at least maintain iron stores.

- The TBA-Daily (Group 1) Group women during pregnancy demonstrated an increase in knowledge of the symptoms, risks, and prevention of anemia that, in most cases, surpassed the improvements made by the Control Group.

- The data indicate that mebendazole did not enhance the increase in hemoglobin in the TBA-Daily (Group 1) and Control Groups more than the placebo. It is possible that this was due to the moderate intensity of hookworm infestation in study participants.

- Surveys clearly demonstrate that TBAs trained in the program are in greater demand and receive a significantly higher payment for their services.

V. Conclusions:

1. **TBAs are effective at distributing and monitoring the intake of iron/folate tablets and educating pregnant women about the importance of anemia treatment and prevention in rural areas.**

2. **TBAs delivering and monitoring supplies of daily iron/folate tablets containing 60 mg of elemental iron on a weekly basis can increase compliance and thus increase hemoglobin levels in pregnant women.**

3. **Daily intake of iron/folate is more effective at combating anemia than is a weekly intake regimen in this population.**

4. **The contribution that de-worming can make to anemia prevention may be dependent on a high worm load at baseline.**

VI. Recommendations:

The results of this study demonstrate the important role that TBAs can play in addressing barriers to successful iron supplementation programs and decreasing maternal anemia. By visiting their pregnant patients weekly, they ensured a consistent supply of iron supplements, and through health education and motivation, they encouraged women to consume the full dosage of tablets. It is now important to implement additional operations research to gauge the effectiveness of TBAs selling iron supplements in the community.

The Maluku study demonstrated that daily dosing is more efficacious than the once-weekly regimen with two iron/folate tablets in this target population. Proponents of weekly regimens contend that a superior absorption seen with intermittent doses will result in equal or greater impact than daily dosing. In this study there was a dose-response relationship between the total amount of iron ingested and a rise in hemoglobin. Total iron consumed was the most important predictor of hemoglobin elevation. It is recommended that the existing MOH policy be changed to either:

- provide more iron supplements for a longer period of time, or

- support a mechanism such as local village distribution of iron supplements and education/counseling by village midwives or TBAs to substantially increase women's ability to consume the full dose of 90 tablets currently distributed.

VII. Publications:

Robinson, J.S. *Using Traditional Birth Attendants to Improve Iron Tablet Utilization by Pregnant Women*. MotherCare/John Snow Inc., Project Concern International San Diego, CA. (1999).

Robinson, J.S. *Working with Traditional Birth Attendants to Improve Iron Tablet Utilization by Pregnant Women*. MotherCare Technical Working Paper #7. Arlington, VA: John Snow, Inc., Manuscript in preparation.

Figure 1

IRON SUPPLEMENT STUDY DESIGN